The Excavating Engineer

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Electric Shovel Operation on the McKay Dam, Oregon

Description of Construction of Large Gravel Fill Dam in the Umatilla Valley, Oregon, by the United States Reclamation Service

TWO hundred and ten miles east of Portland, and twelve miles west of Pendleton, in the Umatilla Valley of northeastern Oregon, lies some 40,000 acres of fertile land which needs but one thing to make it a commercial success — that is a dependable and controllable supply of water.

As a result of numerous petitions to the government, the Department of the Interior investigated five points on the McKay Creek, which is a tributary of the Umatilla River, finally deciding on a location for an irrigation project about four miles from the mouth of the creek.

Owing to the high prices demanded by those in control of the land selected for this project, the actual construction was delayed pending suits in condemnation required to secure possession.

However, favorable results were obtained, and the construction was started by the United States Reclamation Service in July 1923 on what will be known as the McKay Dam of the Umatilla Project. It is expected that the work begun in 1923 will be finished in 1926.

When completed this dam will create the McKay Storage Reservoir, which will store some 75,000 acre feet, or approximately 25 billion gallons of water. This water will not be used for any land about Pendleton but will be held in reserve, to supplement when necessary the waters of the Umatilla River, irrigating farms at Echo, Stanfield, Hermistine and Umatilla, which are some 25 miles to the northwest of Pendleton.

As a result of the Umatilla Project, land in the vicinity of these towns bids fair to become a very profitable investment for the production of alfalfa, fruits, vegetables, honey, and dairy products.

A Gravel Dam of 2,400,000 Cubic Yards

This dam is of the gravel fill type, having a 12-inch reinforced concrete face on the upstream side only. This face has a slope of 1¾ to 1, while the slope on the downstream side is 2 to 1.

The maximum height will be 160 feet from the creek bottom to the top. The breadth of the dam across the top will be 20 feet; it will have an overall length of about 3000 feet, and will contain approximately 2,400,000 cubic yards of gravel.

River Bed Supplies Gravel for Fill

The gravel is taken from pits in the valley which are located about a mile from the dam on the upstream side.

The cuts in the gravel pits average about 7 feet in depth. As the gravel is removed, the bottom of the pit becomes water logged to a depth of from 6 inches to 2 feet, which makes it necessary for the pit men to work continually in the conventional rubber boot.

The other Bucyrus 80-B electric shovel digging gravel. These machines average 2400 cubic yards apiece in two eight-hour shifts.

Electric Shovels Working on the River Bottom

In the gravel pits are two Bucyrus 80-B, electrically operated revolving shovels with 2½-yard dippers. These shovels, equipped with special short booms and dipper handles for rock service, were purchased by the United States Reclamation Service in 1923 for the McKay Reservoir Project.

The material is so densely packed that the digging is harder than appearances might indicate. We are informed, however, that the shovels average four cycles per minute, and that the maximum

yardage to date is 1800 cubic yards per shovel per shift of 8 hours.

However, the average is about 1200 cubic yards per shovel per shift, which makes a total of about 4800 cubic yards of gravel delivered at the dam in a day of 16 hours, two shifts.

Electrical power for these shovels is received at 2300 volts from Walla Walla, Washington.

The way from the gravel pits to the dam is double tracked, while upon the dam and in the pits single track with turnouts are provided for the dirt trains. There are approximately 120 4-yard dump cars in use on this job — Petler, Western and Continental. Cars are equipped with extra sideboards so that they hold 4½ yards. Each train is composed of twelve cars, and hauled by 18 and 20-ton, 36-inch gauge oil-burning locomotives, both American and Davenport. The round trip is made in about 40 minutes. The gravel is dumped directly on the dam in longitudinal rows, is spread with teams into layers about 6 inches deep, and rolled with two 10-ton oil-burning steam rollers.

Present Diversion Tunnel to Become a Sluice

Winding its way around one end of the dam, in horseshoe fashion, is a tunnel for the purpose of diverting the flow of the river water from the upstream side to the immediate downstream side of the dam, during the course of construction.

This tunnel, which is 10 feet in diameter, 700 feet long and lined with concrete, was drilled and shot through the solid lava rock abutment of the right end of the dam.

When the dam is completed this tunnel will be equipped with gates, and used as an outlet for the irrigating water to the Umatilla River, and thence to the land covered by the project.

A Concrete-Lined Spillway

A spillway with a concrete-lined channel is being constructed at the top of this same solid lava rock abutment, which is also designed to direct the spilled water back to the stream at the immediate downstream side of the dam.

This spillway, like the tunnel, was a solid piece of rock excavation and shot under the direction of Robert Tomson. When completed, this spillway will be equipped with 10 radial gates designed to discharge 10,000 cubic feet of water per second.

Organization

As mentioned, this project is directly under the control of the United States Reclamation Service, and the work is done with government forces.

In all there are about 265 men working on the job. R. M. Conners is construction engineer; Ralph Lowry, resident engineer; Nicholas E. Fordham, master mechanic; and Robert Tomson, a veteran tunnel man, is in charge of rock excavation.

At the pit the shovels are operated by W. K. Olmstead, A. B. Gale, Frank Strobe and Ben Smith, with one oiler and one pit man per shift.

Use Explosives to Shoot Bank in Canal Work

The deepening and widening of the Delaware and Chesapeake Canal, connecting the two historic eastern bays, which is now under way, will be completed, it is estimated, in one-quarter the time it took to build the original waterway, due to the efficiency of modern dredging machinery, explosives, and engineering skill. At the present time the heaviest section in the whole right-of-way is being cleared out, involving the removal of 5,600,000 cubic yards of material along a stretch of two miles. In this section a powerful suction dredge is taking out a bank 90 feet high consisting of layers of clay and sand. A rather unusual feature of the work is the fact that although no rock is encountered explosives are being used to facilitate the removal of material. This is done by putting the powder in wet, well-drilled holes, spread forty feet each way, and from 40 to 50 feet in depth. When they are shot no explosion takes place on the surface, throwing the dirt into the air, but the full force is confined inside the bank, so that the dirt is well loosened and feeds freely into the dredge.

By this explosives method the efficiency of the dredge has been doubled and the danger of the bank falling eliminated. The material going through the dredge is lifted 75 feet over the banks of the canal and over a dike, and is then poured into a condemned area of 240 acres. It is estimated there are approximately 2,500,000 yards to be shot.

The improvement in the canal will make it almost three times its present width, and will increase its depth from 9 feet at low tide to a depth of 12½ feet. The canal connects the Delaware River and the Chesapeake Bay. It was originally dug 100 years ago, and as many as 2600 men were employed at one time in its construction. When completed, it was regarded as one of the greatest engineering works of the period.

Indiana is rather unique in having a law compelling the county highway superintendents to attend the road school at Purdue University with expenses paid by the respective counties.

A similar bill is being advanced in the present legislature in behalf of the county surveyors.

Dragline Operation on a Mexican Irrigation Project

Development of Sugar Lands in the State of Sinaloa — Description and Costs of Diesel Dragline Performance

DOWN below the southern boundary of the United States, where the Pacific thrusts a long finger northwards into the west coast of Mexico, to separate lower California from the main land, lies the State of Sinaloa. Gradually it rises from its flat and sandy coastal lands to the lofty forest-clad heights of the Sierra Madre Mountains, whose peaks rise some 7500 feet above the sea.

This land, which for centuries has been famed for its gold, silver, copper, iron and lead, has gradually developed its other resources until old Sinaloa bids fair to become a district of great agricultural and commercial promise.

In long years past but little more was produced there than would feed its people, while today, thanks to its enterprising development and its irrigation canals, the agricultural exports hold a place of growing importance in the markets of the world.

Cotton, corn, wheat, tropical fruits and sugar now form important items in this wealth, but it is sugar cane that holds forth great encouragement for the future.

Irrigation System

The Cia. Azucarera Almada Soc. Civ. (Almada Sugar Company), one of the most enterprising concerns in Western Mexico, has its sugar cane plantations and its refineries at Navolato — an industrial town of about 6,000 people, some 20 miles down the valley from the city of Culiacan, which is the capital of Sinaloa. From Culiacan down, the Valley of the Culiacan River forms an alluvial delta, Navolato being about midway between the sea and Culiacan, along this coastal plain.

View of portion of canal finished on one side. Dragline completes one side, and then, moving back on other side of canal, completes the work.

This company is not only interested in the production of sugar, but is earnestly engaged in the development of the entire Culiacan Valley.

Thousands of acres of this fertile irrigated land is let out to private farmers, and colonists who raise tomatoes, melons, alfalfa and other farm products for export.

View from Center of Small Footbridge, Showing Canal Before Widening

Of the 110,000 acres of land owned by this company, some 40,000 acres are located on the south side of the river. At present not more than 10,000 acres are irrigated, but as new land is planted in sugar cane, or taken up by private renters, the work of irrigation is extended.

It is the aim of this company to furnish irrigation for every acre of irrigable land on the south side of the river, and the construction and location of the entrance gates give assurance that they will always have a reliable and abundant supply of water from the river. In this great land of promise there are two important irrigation canals—namely, the Canal Rosales and the Canal Francisco Canedo.

Canal Rosales and Its Effect

Canal Rosales, the construction of which was described fully in *The Excavating Engineer* for November 1923, is one of the greatest works of its kind ever undertaken by the Mexican Government. It lies in the Culiacan Valley at the fanshaped junction of the Humaya and Tamazula Rivers, and may be said to stand as a monument to Mexican accomplishments.

It was built in the years 1921 and 1922 under

the able supervision of General Angel Flores, Military Commander of the West Coast and Governor of the State of Sinaloa. Its construction is of interest from an engineering point of view, from the fact that it was the first time that the usual hand and team methods of excavation had given away to machinery — a Class-14 Bucyrus dragline having handled a large part of the heavy work.

Dragline working on bank. This machine builds up bank 8 feet above original height.

The moral effect of the energy and perfected organization which was demonstrated on this project cannot be over-estimated. This influence is already showing results throughout this important district of Mexico.

Description of Canal Canedo

But it is with the Canal Canedo, however, that this article deals. It is of particular interest on account of the progressive methods used for its excavation and maintenance. This canal, which runs from Culiacan to Navolato, is the property of the Cia. Azucarera Almada Soc. Civ. Owing to its favorable location, construction, etc., it is "the canal of the Culiacan Valley," and will remain so until the construction of impounding reservoirs, diversion dam and other costly work shall stabilize the flow of the Culiacan River and lift the Canal Rosales out of the category of a "flood water" canal.

The Almada Sugar Company suffered somewhat during the five or six years of active revolution, but since that time there has been a most decided forward impulse.

The service demand of this canal became so great that extensive developments were absolutely necessary.

Why Diesel Dragline Was Used

It soon became evident that in order, adequately, to take care of this growing demand, its capacity must be doubled. This not only called for an extension and lengthening, but a widening and deepening of the present canal.

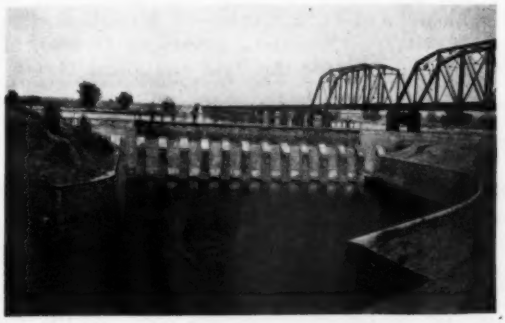
Moreover this construction must be done in such a manner as not to interfere with the delivery of water to the plantations, as the successful outcome of the season's planting in this section of Mexico depends almost entirely on the ability to irrigate at certain intervals. On account of the great damage that the thousands of acres of the Cia Azucarera de Almada might suffer if deprived of this vital water supply, the problem of the construction work was given most careful consideration and study by the directorate of the company. After thorough investigation it became evident to the engineer that the dragline excavator was the only feasible tool — not only because of its well-known ability to excavate below its own level, under water as well as in dry material, but because of its mobility, general handiness and adaptability to other excavating work. Accordingly, it was decided that a dragline excavator should do the work.

But further problems were presented. Coal or wood for fuel could only be supplied to the machine with difficulty, as it would be operating at times in positions difficult of access, such as on the tops of sandy banks. Also boiler water from the canal would not always be available for a steam operated machine, as occasions might arise when it would be necessary to operate the dragline when the canal was dried up for other construction purposes. Water would then have to be hauled

Point where canal was widened to 33 feet at the bottom. Canal bank is about 25 feet high at this point.

from the river or obtained from wells dug at frequent intervals. These difficulties in addition to the expense and trouble of pipe connections, made it impossible to use a steam machine with economy or efficiency. These conditions led to the purchase of a Bucyrus 30-B dragline excavator equipped with a 55 h. p. oil engine of the full Diesel type, equipped with a 40-foot boom and 1-cubic-yard bucket, mounted on caterpillars. This was the first machine of its class to be used in Mexico.

The caterpillar mounting was chosen due to the realization that a dragline to be of value on such an extensive project as this one should be easy to move and able to propel itself greater distances than possible with any other type of mounting, and have the ability to move over ground of various degrees of firmness and moisture. It was used for the new construction and enlargement, above mentioned, as well as for the excavation for the flood gate foundations, removal of large rocks from diversion dikes, and driving and pulling piles.



Head Gates to the "Canal Francisco Cañedo," Showing Southern Pacific Railway Bridge in Background

Dragline Performance

To quote the words of F. E. Butterfield, Jr., Engineer for the Almada Sugar Company: "This machine is suited to do the work well and economically — the fuel and water haulage being reduced to a minimum in this type of machine, which is a great convenience in the case of high, sandy banks, as we have.

"Had the machine been steam operated, for the class of work we have done with it, the transportation of fire wood, for example, would be extremely costly, as would also the constant necessity of moving the pipes which would supply water to the boiler.

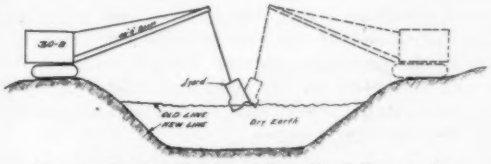


Fig. 1. Showing Method of New Canal Construction

"In certain operations we have advanced as much as 150 meters, (nearly 165 yards) in a day, which would have meant having two pipe connections per day at the least. When we were working on unused canals, it would probably have been necessary for us to have pumps at frequent distances or to pay five or six pesos daily for the transportation of water."

Method of Operation

The accompanying sketches illustrate the method of excavation. Figure 1 illustrates the manner of handling new canal construction. This section had a bottom width of 10 meters (33 feet). The material was mostly dry sand.

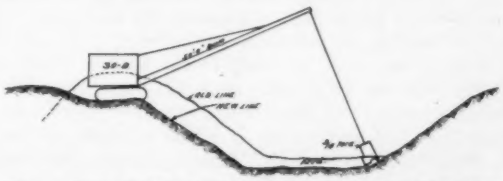


Fig. 2. Cross Section of Widening and Deepening Operations

The dragline, equipped with a 40-foot boom and 1-cubic-yard bucket, handled half of the canal from one side, advancing along and working the bottom and farthest bank for a stretch of about 600 feet, and then crossing over and completing the ditch from the opposite side. The arc of swing averaged from 100 to 120 degrees, which made possible the most rapid progress, the output averaging not less than 400 cubic meters (520 cubic yards) per day.

Figure 2 illustrates the method of widening and deepening the old canal so as not to interfere with the water supply. In order to handle the work most efficiently, the dragline was equipped with a longer boom and smaller bucket, i. e., 50 feet and ¾ cubic yard. The swing aver-

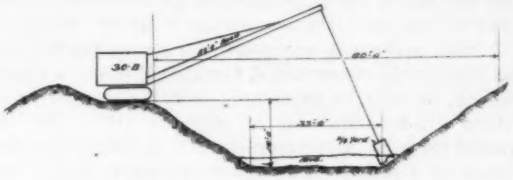


Fig. 3. Manner of Cleaning Out Canal

aged 180 degrees. On account of the longer swing, smaller bucket and the varying character of material, it was impossible to maintain as high a yardage as on the new construction, but from 250 to 265 cubic meters (325 to 350 cubic yards) per day, was considered a good average.

The third class of excavation, that of cleaning out the old canal, is illustrated in Figure 3. The canal at its entrance from the river has a low fall and a sluggish current, which leads to a continual deposit of mud and silt.

To clean out this section the dragline was used as shown in Figure 3.

It is interesting to note that the caterpillar equipment is more than living up to expectations on this project, and justifies the judgment of the directors in adopting it. To have moved this ma-

chine 600 feet on soft dirt in one day on traction mounting, digging all the while, would have taxed the ability of our best contractors, while the caterpillar mounting accomplished it with ease.

Costs and Output

During the rainy season which occurs from the end of June to the last of September, excavation is either partly or entirely suspended. However, for a 12 months' period, from March, 1923 to June, 1924, with the rainy season omitted, 41,518.8 cubic meters (54,306.6 cubic yards) were excavated in 1433 hours and 51 minutes working time, or 29.1 cubic meters (37.9 cubic yards) per hour.

This was at a cost of seven cents per cubic yard, including labor, fuel at 26.8 cents per gallon, lubrication, repairs and miscellaneous costs. More recently fuel has been obtained in carload lots at a price of 32 cents (Mexican) or approximately 16 cents United States currency per gallon, which would tend to reduce the figure given above for the cost per yard. This price includes freight, consular invoice and customs agent's bill amounting to .226 pesos per gallon.

The lubricants cost $551.56 (Mexican) or $275.78 (United States) for the period. Lubricants were purchased at $1.25 to $1.50 per gallon.

We are indebted to F. E. Butterfield, Jr., Engineer for the Cia. Azucarera Almada Soc. Civ. and to W. C. Chapman, American Consul, Mazaltan, Sinaloa, for the data contained herein.

Mountain Transportation of Heavy Equipment

A Nine-Mile Journey over Rough, Steep and Winding Road in Oregon with Tractors and "Bummers"

"CUTTING up" or "knocking down" heavy excavating machinery for mountain transportation is a serious proposition when the question of cost is considered.

However, that is just what was being done in the mountains of Oregon until Rajotte-Winters, Inc., and their master mechanic, Chas. E. Grove, pulled off a stunt, illustrating another of the many problems solved by the caterpillar or crawler.

About 100 miles south of Portland, Oregon, and 9 miles out of Oakridge, is the Natron Cut-off of the Southern Pacific Railroad, the construction of which has recently been placed under contract.

This project is accessible for heavy traffic only by the newly-constructed Cougar Mountain Road, which, as may be expected, is well equipped with steep grades running as high as 10%. At one place there is a continuous 8% grade for a distance of 4 miles. Curves are so sharp that a six-horse team with an ordinary wagon finds it difficult to negotiate — not a happy thought for one who has a large railroad-type shovel to haul.

Since contracts were let for this railroad extension Cougar Mountain Road has become an important highway. It reminds one of the old gold fever days of the West. Then it was the covered wagon, but today it is the steam shovel, the locomotive and other heavy equipment designed to pave the way for a higher civilization.

Therefore, this road must be kept open for this traffic. Things must be kept moving, and so it was with Rajotte-Winters. Whatever scheme they decided to put through must go through or cause congestion, and the caterpillar solved the problem successfully.

As mentioned, the process of 'cutting up" the equipment into convenient units was under way. This process of dismantling heavy machinery, and the consequent re-erection, is always an expensive one, to say nothing of the time lost in getting on the job.

Therefore, with a knowledge of logging operations on the timber lands, and some careful planning, Rajotte-Winters decided to try out Holt "bummers" or caterpillar trailers.

The boom, dipper and handle of their Model 60 Marion steam shovel were removed; the carbody jacked up; the railroad trucks run out; the caterpillar trucks run in; two 60 horsepower Best tracklayer tractors hooked on, and away she went up the Cougar Mountain Road to the job.

Several bridges had to be crossed. On one of these bridges, the wheels of a wagon carrying a 4-ton boiler had broken through only the day before. It had not been repaired, but the "bummers," with a load of nearly 45 tons, crawled right over the hole without even cracking another plank.

The trip of 9 miles was made in 30 working hours, or at the rate of 3¼ miles per hour. The sharp curves were made with very little difficulty, several of which could never have been negotiated with the shovel on its own wheels and trucks.

For the photographs and data for this article we are indebted to Mr. Chas. E. Grove, master mechanic, Rajotte-Winters, Inc., railroad contractors of Oakridge, Oregon.

On Two Counts

"The way of the transgressor is hard," commented the country justice as he fined the motorist for exceeding the speed limit.

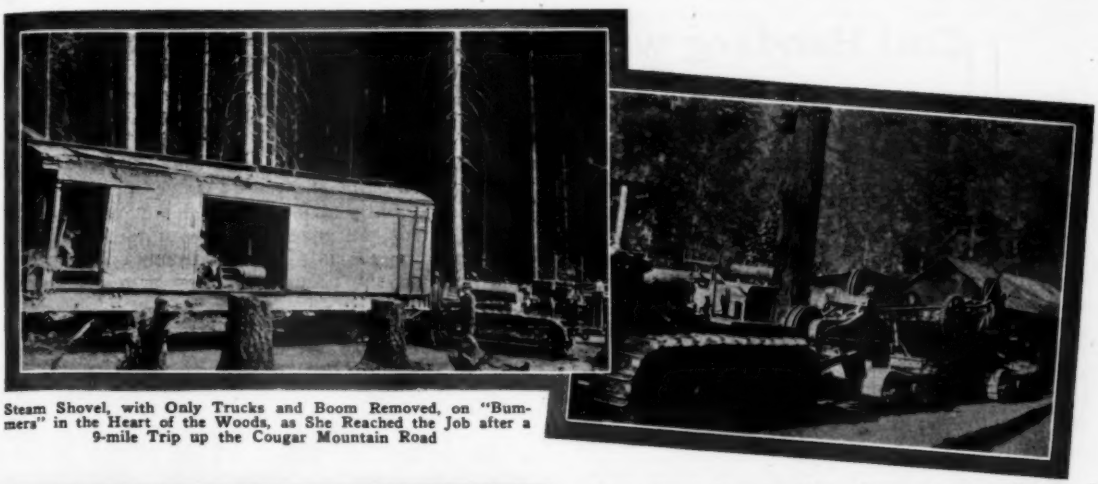
"Not around here it ain't," retorted the motorist. "I never saw such mushy roads in my life."

"Ten dollars extra for contempt!" shouted the justice.

"Why, I haven't made any remarks about you, judge."

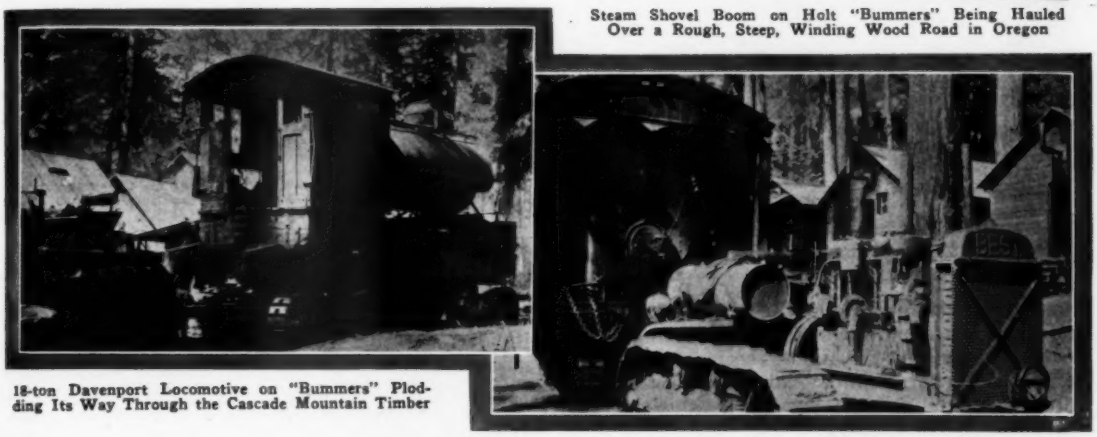
"Yes, you have," was the reply. "I'm road commissioner here as well as justice o' the peace."

— *Boston Transcript.*



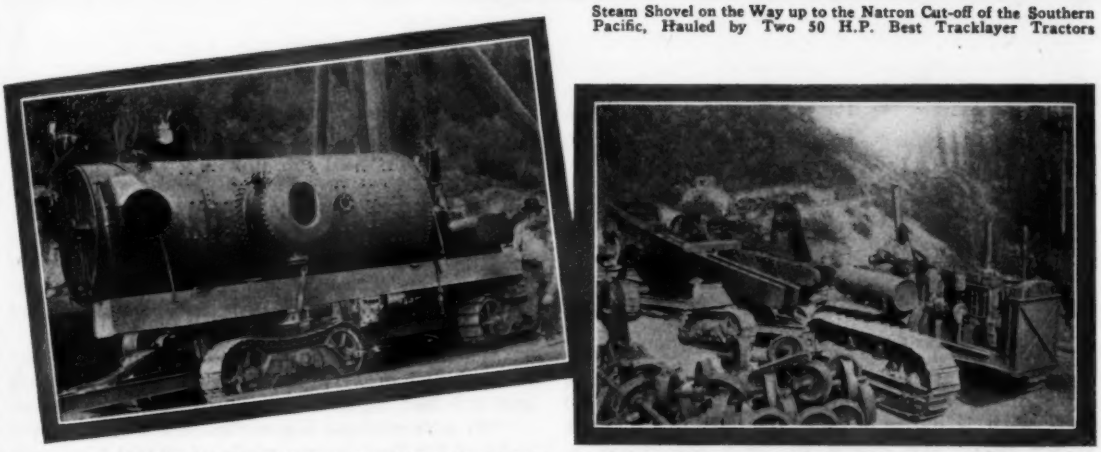
Steam Shovel, with Only Trucks and Boom Removed, on "Bummers" in the Heart of the Woods, as She Reached the Job after a 9-mile Trip up the Cougar Mountain Road

Steam Shovel Boom on Holt "Bummers" Being Hauled Over a Rough, Steep, Winding Wood Road in Oregon



18-ton Davenport Locomotive on "Bummers" Plodding Its Way Through the Cascade Mountain Timber

Steam Shovel on the Way up to the Natron Cut-off of the Southern Pacific, Hauled by Two 50 H.P. Best Tracklayer Tractors



Boiler and Engines of Henry-McFee's Model 61 Marion, which had been "cut up" and transported. Weight, 22,000 pounds; distance, 13 miles; maximum grade, 10%, with 4 miles of 8%; time, 9 hours.

Steam Shovel Boom, Dipper and Handle on "Bummers," Hauled by 60 H.P. Best Tractor, on Its Way through the Cascade Mountains

Coal Handling with a Clamshell Excavator at a French Coal Mine

Operation of a Bucyrus 20-B in Compagnie des Mines d'Aniche

A MAP is not necessary to bring up clearly to the minds of our readers the general location of the mines of Aniche. It is only necessary to mention Lens, Cambrai, Bapaume, Albert, and a few such memorable names in that shell-torn section of France. Aniche lies about 20 miles from Lens, not far from the border of Belgium. Its mines, however, suffered less from the fighting than those about Lens. This was due principally to the fact that during the greater part of the war, they lay quite a distance behind the German front lines. During the German re-

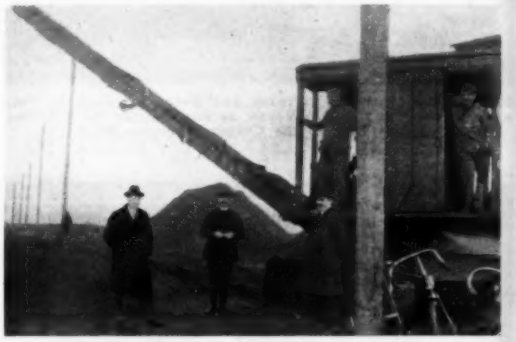
Bucyrus clamshell excavator overcasting to stock pile. It will be noted that the coal is very fine, almost coal dust.

treat in 1918, however, just before the Armistice, there was quite a little sharp fighting about this town. Aniche today is one of the most important mining centers in France, and the Compagnie des Mines d'Aniche are owners of the third largest coal mine in the country.

Lowering the Clamshell Into a Coal Car

On their property they operate a dozen pits, the average depth of which is approximately 1600 feet, with a daily output amounting to about 10,000 tons. The extent of their operations is shown by the fact that they employ over 12,000 miners. The majority of this labor is from Poland.

The output of this mine has been steadily increasing during the past few years, and there has consequently arisen a need for more up-to-date methods, for mechanical equipment and the most economical mining machinery. To supply this demand the Compagnie des Mines d'Aniche



Mr. Poupart is standing at the right next to the machine, his assistant in the center; Mr. Marlow, of the London office of the Bucyrus Company, is on the left.

recently purchased a 20-B steam-driven Bucyrus clamshell excavator, equipped with a 35-foot boom and a ¾-yard clamshell bucket. The machine has been found very useful about the mine, its extreme versatility proving of value on the many different jobs which arise on a property of this sort. It is at present employed in unloading 20-ton cars and overcasting on to stock piles. It is also being used in loading barges at the bank of the canal which adjoins the company's property. In shifting from one job to the other, it climbs a 23% grade with no apparent effort.

A New Water Power Project

The State Engineer of Utah has approved the application of the Utah Power & Light Company for authority to divert 2,500 second feet and to use a storage of 75,000 acre feet on the Bear River in Utah.

This removes the last obstacle in the way of construction of the power company's hydro-electric development on the Bear River in Box Elder County, Utah.

Work is expected to begin early in the spring. A combined gravity and arch dam, 500 feet long and 110 feet high, will be built across the river.

The power house below the dam will develop a head of 128 feet in two units of 20,000 h. p. each.

The estimated cost of the entire development is approximately $5,500,000.

Rock Creek Cemetery Extension

Excavation in a Historic Church Yard at the National Capital

In July 1924 E. G. Gummel of Washington, District of Columbia, was awarded a contract calling for the regrading and improving of an addition to the historic Rock Creek Cemetery, one of the oldest and most famous church properties of the National Capital.

The directors of this property showed their faith in Mr. Gummel's ability by letting the contract without asking for competitive bids.

The problem that confronted the contractor was the development of eighteen additional acres of burial ground, which involved the stripping of 5000 cubic yards of top soil, the removal of 50,000 cubic yards of sub-soil, and the final replacement of the top soil.

The cuts ran from one to five feet in depth through a stiff gravel and clay strata, which was used to make fills where required.

For this work Mr. Gummel purchased a 20-B Bucyrus shovel, which, under the hand of M. J. Fahey, and his fireman "Pete" Morrison, averaged 400 cubic yards per day.

E. G. Gummel's 20-B Bucyrus Shovel at Work in Rock Creek Cemetery

Material was hauled in 1½-yard Watson dump wagons, and the grading and leveling of fills, etc., handled by small Western scrapers.

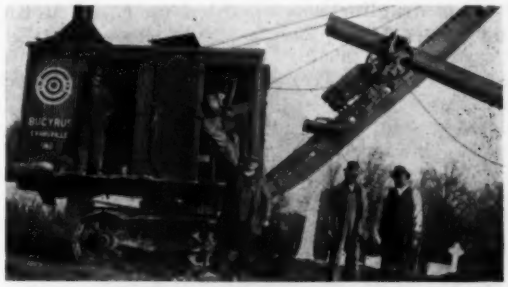
A Bit of History

Rock Creek Cemetery lies at the summit of the highest range of hills north of Washington, and embraces an undulating inclined surface, commanding an extensive landscape shaded by forest trees of great age.

In the fifteenth century this ground was purchased from Indians by Col. John Bradford for the sum of six barrels of tobacco. Later in colonial days, in the year 1719, this English Colonel deeded the land to St. Paul's Church, Rock Creek Parish.

As was the custom of the older days, that portion of the property lying about the church has long been used for interment. Here is the final resting place of many senators, congressmen, judges, justices of the Supreme Court, and other persons of distinction.

The plot of ground now being improved is the old homestead site of James A. Buck, who for



E. G. Gummel Standing Near the Operator, M. J. Fahey, "Pete" Morrison, Fireman

forty-four years was rector of St. Paul's and who passed away in 1897.

This famous old burial ground is known as "The Cemetery of Monuments," and it is safe to say that an average of more than a thousand people a month visit the spot.

Another Pioneer Dragline

An Unusual Type of Early Dragline, Built by a Contractor for a Job Which Presented Very Unusual and Serious Difficulties

In the December 1924 issue of *The Excavating Engineer* we described a dragline excavator of a rather unusual type which was used for digging drainage ditches in the state of Washington 10 to 14 years ago.

Here is another old-timer which dates still farther back in the history of this most versatile piece of excavating equipment. This machine was built by H. K. Luce & Company somewhat prior to 1908 and was used by them on the Sulphur Creek Spillway, State of Washington.

Design Radically Different from That of Today

The framing of this machine was built entirely of timber as shown in one of our views. The original boom was also built of wood, but was replaced by a 60-foot steel boom shortly after it started work, as is shown in another view.

The main engine was 12 x 14 and the swing engine 8 x 10 — both Lambert engines. This machine operated a 2-cubic-yard Page bucket and traveled on skids. It was equipped with a Rochester direct-connected steam lighting plant.

Note that this dragline was not of the revolving type. The swinging scheme was similar to that used on the standard type of railroad shovels,

except that the swinging mechanism was controlled by the craneman, while on the railroad-type shovel this phase of operation is controlled by the operator.

We understand this old-timer produced good yardage, and in spite of its crude construction made money for its owners.

This dragline was operated by E. G. McKay and James Dunn.

A close-up of dragline built by H. K. Luce & Co. prior to 1908. The entire frame is constructed of wood and travels on skids. Note that this is not the revolving type.

It Tackled a Nine-Mile Drainage Job

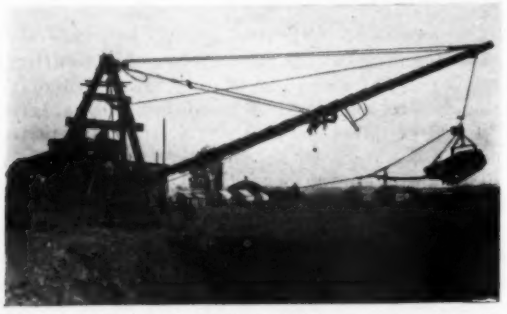
This machine was used on the Sulphur Creek Spillway, which started at the Yakima River about 6 miles south of Sunnyside in the State of Washington and ended at the Sunnyside Drainage Canal about 3 miles northeast of Sunnyside, involving a course of about 9 miles.

This project was started in 1908, and completed in 1910 and cost about $1,000,000.

Apparently there was considerable grief. The work was started by H. K. Luce & Co. who gave up the contract on account of difficulty in excavating for the drops.

The contract was then taken up by H. W. Hawley of Seattle, Washington, who also threw it up for the same reason. But the project was finally completed by the United States Reclamation Service with government forces.

This ditch, which was built to provide an outlet for the Sunnyside Drainage Project, averaged from 12 to 16 feet in depth with a slope of 1.5 to 1.



H. K. Luce dragline after 60-foot steel boom was applied. Note that this machine is equipped with electric lighting plant and a Page bucket.

Construction of concrete drop in the Sulphur Creek Spillway, showing pipe line used in sucking quicksand. Owing to the difficulties with quicksand, this contract was abandoned by two contractors.

Much of the land was waterlogged, and consisted of muck, sand, hardpan and quicksand, which accounts for the caving of the bank as illustrated.

But it was the quicksand which caused the contractors so much grief in the construction of the drops in this spillway and made their cost many times more than the original estimates provided for.

This dragline, crude as it may appear to many of our readers, cannot lay claim to being the real pioneer; as we have published before in these columns there is record of dragline equipment as far back as 1903, when a crude type of drag bucket was tried out on a stiff-leg derrick on the Illinois and Mississippi Canal.

Dragline built by H. K. Luce & Co. at work on the Sulphur Creek Spillway, State of Washington. Note how the ground is caving on account of its waterlogged condition.

For the photographs and data herein we are indebted to E. G. McKay, who was employed as its operator during the period of the canal construction.

The Excavating Engineer

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THE EXCAVATING ENGINEER PUBLISHING CO.
Bradlee Van Brunt, Manager and Editor
South Milwaukee, Wisconsin
Printed in the U. S. A.

The General Outlook

Confidence is the word which best describes the general business outlook.

This is reflected in the stock market, in heavier bank clearings, and speeding up of industry.

New projects are being planned and old projects revived. Confidence is flowing through the business world.

Stocks and bonds are moving upward; money is readily obtainable at low rates; the railroads give evidence of extensive improvements as indicated elsewhere on this page; steel and automobile trades record a gain; revenue freight car loadings are at a record; and so one might go through the entire list of industries.

The Need for Greater Mileage of Improved Roads

Somewhat more than 17,000,000 motorists now ride the roads of the country. There are in the neighborhood of 3,000,000 miles of road for them to ride upon, if they will. It is but human nature, however, for the great majority of these 17,000,000 to seek the 430,000 miles of so-called improved highways.

If the entire 17,000,000 should by chance seek to ride upon the improved roadways at one time, there would be 73 cars to every mile of highway.

Although, of course, all cars are not run upon these roads at one time, it is too obvious almost to mention that these improved highways are not only overcrowded but becoming more so year by year.

The automotive industry, therefore, are outstripping our road-building forces, and are outstripping them at a fast increasing rate.

Automobile manufacturers predict that the day is not more than 3 to 5 years distant when we will have more than 30,000,000 motor vehicles on our highways.

Two facts are quite apparent from the above. First, that there will be no slackup in work for the road contractor at least for this decade. Second, that the automotive industry will soon find that their future sales will depend more and more upon the ability of the road builders to make way for them.

Only a few years ago the railroads found their long steel lines reaching out into uninhabited plains and wildernesses. Their activities in advertising and bringing before the public the possibilities of this land for farming, have resulted in loaded platforms of freight and passenger depots all through this country into which they came as pioneers. It will be interesting to watch whether the automotive industry will similarly carry on an active campaign for better roads, benefiting thereby not only our own business but that of the entire country.

It is estimated that the boat shipments of iron ore from Lake Superior for 1924 total approximately 42,000,000 gross tons.

The lake shipments for 1923 totaled 59,036,704 gross tons. The average season's shipments for the five years from 1911 to 1915 inclusive was 41,500,000. From present prospects the year 1925 will see Lake Superior shipments amount to 60,000,000 tons.

A greater mileage of new electric railway track was laid in 1924 than in any other year since 1917.

Oil and Gas Power Week

The week of April 20th to 25th has been set aside by the following technical organizations as Oil and Gas Power Week: American Chemical Society, American Society of Mechanical Engineers, American Petroleum Institute, American Society of Naval Engineers, National Association of Stationary Engineers, National Safety Council, American Society of Marine Designers, American Institute of Chemical Engineers, United States Bureau of Standards, United States Bureau of Mines, and The Society of Naval Architects and Marine Engineers.

The purpose of this week is to focus nation-wide attention on the part of physicists, chemists, engineers, operating men, and the industries, on recent progress and on immediate possibilities in this basic technical field by means of simultaneous technical meetings, discussions, publicity, etc.

The organization is in charge of a national committee, and meetings will be held in all the leading oil and gas centers in the United States, on the subjects of fuels, engine design, operation, economics, trends, research problems, etc.

Complete information may be obtained by writing direct to W. E. Bullock, 29 West 39th Street, New York.

Proposals for Levee Work

At the office of the Secretary, Mississippi River Commission, 1311 International Life Building, St. Louis, Missouri, sealed proposals will be received until 11 a. m., April 28, 1925, for constructing about 300,000 cubic yards of earthwork by hydraulic method in Iowa River-Flint Creek Levee District No. 16, Iowa. Further information on application.

· FIELD NOTES ·

Rapid Installation of Caterpillars Under a Railroad-Type Shovel

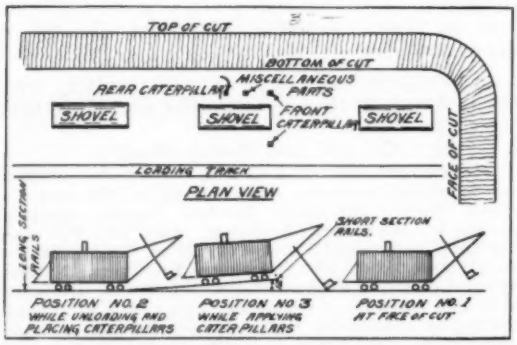
We are indebted to H. H. Otto, mining engineer, and to R. A. Stemer, stripping engineer, of the Lehigh Coal & Navigation Co., for the following description of a rapid installation of caterpillars on a railroad-type shovel.

The caterpillars were made by the Bucyrus Company for a Bucyrus 70-C shovel located at the Number 3 Primrose Slope Stripping Mosquihoning Colliery of the Lehigh Company, at what is known as Little Italy near Lansford, Pa.

The shovel has been in service for the past 12 years, and was transferred to the stripping on the 23rd of last January.

The installation was started on January 24th, and the shovel was back on the job again January 28th, only 33½ hours' actual working time. There had been considerable snow, and the temperature was varying from 0° to 32° above, so although this time is short for any weather conditions, it might be cut under more favorable circumstances.

To apply the caterpillars, the shovel was moved



Sketch Showing Arrangement of Shovel and Parts During Installation of Caterpillars

back from the face of the cut, on 30-foot rails, to a convenient position. The new caterpillar equipment was brought up on the loading track in narrow-gauge trucks, lifted and swung by the shovel to a predetermined position on the ground ahead of the shovel.

An inclined track of short section rails was laid ahead of the shovel, and the machine moved up until it reached a point where the track was about twelve inches above the ground. Here the old jackarms were dropped off the shovel. The shovel was then moved ahead until it was in the proper position relative to the caterpillar equipment on the ground.

The new jackarms and caterpillars were applied; the front end of the shovel jacked up about 2 inches; and with the dipper set far ahead, to allow ample room, the railroad trucks were pushed out ahead, and the shovel dropped back on the front caterpillars.

The rear caterpillar was drawn in under the center of the shovel, in front of the rear truck, while the rear end of the shovel was being jacked up. The rear truck was then removed and the rear caterpillar backed into place.

In the meantime, the propelling machinery, etc., under the shovel, was connected up, and the shovel was then ready for the job.

For the planning and the successful execution of this prompt installation credit is due to S. E. Thorne, stripping superintendent; F. S. Gallus, superintendent of local stripping; and to Harry Mochanier, master mechanic of the shipping department.

Watch the Lubrication of Your Trucks

If motor truck operators would give more attention to chassis lubrication it would result in longer life and better operation of their trucks. The average truck operator observes the ordinary precautions in engine lubrication but often neglects his chassis, which requires consistent, and at many points daily, attention.

Instruction books indicate the points on a chassis which should receive most consistent attention, and these instructions should be followed to the letter.

In engine lubrication we will touch only upon points which are most often overlooked by the operator.

On cold mornings the engine should be warmed slowly because the oil is thick, and while your oil pressure gauge may show a high pressure when the motor first starts, if you will watch it, you may see it fall back almost to zero, due to the oil being too cold to pass through the screen readily. Get the habit of watching the oil pressure gauge. It is an index to the engine lubrication system. Oil should be changed every 1000 miles or more often. Many operators run 2000 miles successfully on a supply of oil, but the first figure is recommended for any make of truck.

The use of an air filter, which is standard on a few of the higher grade trucks, will keep road dust from working into the engine, and consequently add to the life of oil and the engine's working parts.

The changing of oil regularly, however, can be considered one of the most important points in lubrication, because the very nature of the use of oil necessitates its removal at regular intervals.

SHOTS FROM THE · FIRING LINE ·

Central States Notes

BY M. J. WOODHULL

Bill Hayes of Detroit has his outfit on the job in St. Louis, and is ready to go ahead with the city water main as soon as they give him the word.

J. H. Schaeffer has started on his Illinois Central work.

Arthur Jonsoni is setting up a Bucyrus 150-B shovel at Cambria, Illinois.

New York and Vicinity

BY T. A. BURNS

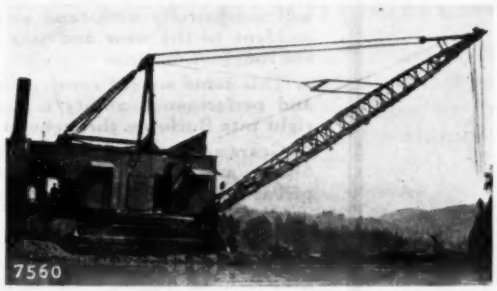
Building construction in Manhattan and the Bronx is about equal to that of last year. Subway construction is now well under way and it won't be long before things are booming. Also, reservoir construction and pipe lines are active, and when the dual and tri-state water sheds and supplies are agreed upon we expect still greater activity.

Oakdale Construction Co. and the Underpinning & Foundation Co. have started work on their section of the subway in Brooklyn, and Hyman and Goodwin, Inc., as well as the Rosoff Subway Construction Co., have broken ground on the St. Nicholas Avenue, Washington Heights construction.

Northwestern States Notes

BY A. B. HANCE, PORTLAND, OREGON

Omar Lyon of Castle Rock, Washington, has sent us a snapshot of a Bucyrus Class-24 dragline crossing the Cowlitz River. This was described in the March issue of *The Excavating Engineer*. While crossing the river,



Crossing the Cowlitz River through Water from Seven to Ten Feet Deep

Ray Cohon, chief operator and manager, operated during the first shift; Charlie Johnson ran the machine during the second, and Omar Lyon was at the levers on the third shift.

J. R. Terteling & Sons, Spokane, Washington, and Moscow, Idaho, were the successful bidders on the eight-mile Kooskia-Kamiah Section of the Lewiston-Clarke Highway. Their bid was $75,000. The highest bid submitted was $95,000.

Bids were opened during the last week in February by the Board of County Commissioners of Mason County, at Shelton, Washington, for the construction of permanent Highway No. 7. The contract was awarded to K. L. Goulter & Company at a cost of $16,885.61.

John Duff, county engineer of Chelan County, announced that contract was awarded to Herbert Gee & Company, 2206 54th Avenue Southwest, Seattle, for construction by grading, surfacing, etc., of 3.4 miles of the Wenatchee-Chelan Highway at $26,355.

James Robbins came up from San Francisco on the 22nd to operate the C. H. Wheeler Bucyrus 20-B Diesel machine at Cochran, Oregon.

Announcement was made at Salem, Oregon, recently by the State Highway Commission that the firm of Greenwood & Dann, contractors, 500 North Front Street, Portland, had received the contract on the Cannon Beach Junction-Hamlet Junction project for $140,490.

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The Final Touch for Crane Efficiency
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BLAW-KNOX BUCKETS

The sixth annual convention of the Pacific Northwest branch of the Associated General Contractors closed Saturday night, February 28th. George W. Gauntlett of Hoquiam, secretary of the Grays Harbor Construction Company, was elected presiding officer for the coming year. Portland was honored with third vice-presidency, which went to W. H. Feigensen, one of the most active members in the association.

A contract was also awarded to S. S. Shell of Oakland, Oregon, for the Myers Creek-Burnt Hill project. Mr. Shell's figures follow: Concrete, $146,430; cedar culvert, $141,794.

Pacific Coast News

BY P. H. BIRCKHEAD AND J. H. SACKETT, SAN FRANCISCO, CAL.

Contract awarded by the California Highway Commission, Sacramento, to S. Wright Jewett, 600 South Grand Boulevard, Glendale, who bid $250,754 for the construction of 16.1 miles of highway in Los Angeles County, work consisting of grading from Arroyo Sequit to Las Flores Canyon.

Contract awarded by Board of Harbor Commissioners, Byrne Building, Los Angeles, to Merritt-Chapman-Scott Corporation, First National Bank Building, Wilmington, Los Angeles, who bid $0.40 per cubic yard, total bid of $90,800 for maintenance dredging for the Harbor Commissioners, City of Los Angeles.

Philadelphia and Vicinity

BY J. A. MURRAY

We are advised that A. E. Dick of Hazelton, Pennsylvania, has been awarded stripping job at Audenreid, Pennsylvania, for the section between No. 2 and No. 7 strippings of the Lehigh & Wilkes-Barre Coal Co, which have been exhausted for two years.

Southern States News

BY W. W. WHORLEY, BIRMINGHAM, ALABAMA

Claude Green is operating a 65-ton shovel, loading slag, for the Central Iron & Coal Company. John Dickey is riding the boom.

J. D. Morris, who has been handling a Marion-21 for P. E. Millsap on Red Mountain near Birmingham, Alabama, recently formed a life-long partnership. Congratulations J. D.

W. H. Mansfield is handling a Bucyrus 30-B for Stone & Webster near Columbus, Georgia. Ellwood Sheffield is keeping things hot.

The Kershaw Contracting Company has been making dirt fly on their double-track work on the East Coast. We understand from Mr. Kershaw that they have secured a large amount of additional work, involving a new cut-off near Palatka, Florida.

S. A. Lacy paid us a visit recently while en route to Texas. Mr. Lacy reports things as active in both Florida and Texas.

J. W. Gwin of Birmingham was awarded 13.5 miles of road in Lawrence County between Courtland and Moulton.

W. H. Pattie, another Birmingham contractor, landed 2.6 miles of bituminous macadam surfacing between Huntsville and Guntersville. Quite a bit of interest was shown in the Fayette-Tuscaloosa work, comprising 19 miles of gravel road between Fayette and New Lexington, there being twenty-eight bids on this project. Nixon & Phillips of Lineville were successful on the road work, and Lamb & McLemore of Eutaw secured the bridges.

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Buckeye NO "Weakest Link"

THIS applies not only to the digging chains—but equally well to all other details of Buckeye construction.

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If you want light for your dredges, shovels, draglines, camps, or for any other place not supplied with electric power and light, send for our 48-page booklet "The Principle and the Proof."

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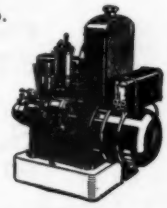

For convenience in making inquiry use postal inserted in this number.

M. M. Bentley of Brantley landed 10 miles of sand-clay work in Butler County.

St. Louis Items

BY A. B. KOENIG

J. B. Murphy is finishing his highway work at Festus, Missouri. He will have a couple of machine outfits idle that he would like to place on some new work immediately.

C. R. Cummins was in town looking over the labor situation and things in general. He may report something new in the next issue.

Ras Rasmussen of the Bates & Rogers Co., Chicago, spent a couple of days with us. He has nothing new to report.

Paul Grafe, local representative of the W. E. Callahan Construction Co., has been out of the city a lot lately looking over new jobs.

Walter Dennison returned from Chicago where he was second low bidder on the new Rock Island work in Kansas. Walter left here to put in a bid on the Missouri Pacific work in Northern Louisiana. He has several good outfits idle which we may report at work in our next issue.

The G. Jellefald & Chapman Construction Co. were awarded contract for sewers in Highland, Illinois.

P. J. Murphy is finishing his state highway work near Mexico, Missouri.

Cook & Waddell have started an outfit on state highway work near Jefferson City, Missouri.

Mr. Hamer of the Hamer-Paskins Co., Chicago, is here waiting for a report from the Missouri Pacific as to who is the low bidder on their new job to be let in Northern Louisiana.

Our old friend Big Jack McCaughey spent a couple of days in town. He was on his way back to Chicago after a month's stay at Hot Springs with Mrs. Mac. The Old Boy looks just as good, but is not quite as spry as he was in the early eighties when the writer first met him. We had a very nice session this trip and a lot of pleasant reminiscences of old times. They have several outfits at work in Chicago on boulevard and park grading at present.

J. J. Daily of the J. H. Flick Construction Co. is back on their Illinois Central Railroad work in Southern Illinois. Daily took a trip over the Rock Island work in Kansas previous to opening bids of the work that was awarded his company later.

Pete Shugart took a much needed rest at Hot Springs, Arkansas.

The Carmichael Cryder Co. was awarded contract for the new Wabash Railroad yards in North Kansas City. They will work a couple of shovel outfits on this.

Graves & Bradley are finishing their road job near Pevely, Missouri. They want a grading contract suitable for a 20-team outfit. Box 268, Herculaneum, Missouri, will catch them.

J. L. Simmons, La Platta, Missouri, has 100,000 yards of team work to let.

W. A. Ross opened a quarry to supply rock on his highway contracts in the western part of the state.

THE MEASURE OF ECONOMY

IF the chain you use actually performs more work for each dollar of its cost than any other that could be obtained, then you are securing real economy. You are, in that event, saving money, regardless of what may have been the first cost.

Taylor-Mesaba steam shovel chain has been made since 1873—for more than 50 years. *It does more work per dollar.*

Stock sizes for all makes of shovels: 5/8", 3/4", 7/8", 1", 1 1/8", 1 1/4", 1 3/8", 1 1/2", 1 5/8", 1 3/4".

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Moreover, in making this study, our men have acquired a broad knowledge of blasting, which is at your service. A combination of this experience, with your detailed knowledge of your own work, may result in valuable improvements in your blasting practice.

We are not offering this co-operation with the idea that it is anything remarkable, or that it is sure to reduce your costs; but as one group of business men talking to another group with similar interests, we ask you to accept our offer if you think you may profit by it.

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POTTSVILLE, PA.
ST. LOUIS, MO.
SALT LAKE CITY, UTAH
SAN FRANCISCO, CALIF.
WILKES-BARRE, PA.
WILMINGTON, DEL.

Albert Hood is getting his outfit in shape to begin work on his new state highway contract near Savannah, Missouri.

C. E. Carson Co. were awarded paving contract in Ogle County, Illinois.

E. A. Wickham died suddenly on March 11th at his home in Council Bluffs, Iowa.

F. E. Perez of the Cook-Waddel-Perez Construction Co., who was hurt recently by a blast at North Jefferson, Missouri, died in St. Mary's Hospital, Jefferson City, Missouri, March 11th. Perez was investigating a battery of blasts and reached one delayed when the explosion occurred. His chest was crushed, one lung punctured, and one of his legs fractured, and the sight of one eye gone. The deceased was 35 years old, leaves a widow and son 16 months old.

T. H. Nichols of the J. H. Flick Construction Co. was here for a day en route to Kansas City to sublet a part of their Rock Island Railroad work.

Sam Smith is in charge of J. H. Flick Construction Co. Camp No. 2 on their Illinois Central job in Southern Illinois.

Canada

Montreal and Vicinity

BY J. M. WARD

The Department of Highways of Quebec will do comparatively little new construction this year, confining themselves to the maintenance program. Formerly the Government did this maintenance work themselves, but this year they are proposing to contract it out, and are now calling for tenders for sections of 50, 75 and 100 miles of various kinds of roads to be maintained over a period of five years. They figure it will be more economical to have it done in this way.

We had a visit from Mr. Thos. Cozzolino of Chicoutimi, who is doing some work at Ville Marie for the Quebec Streams Commission.

Mr. N. De Wind, formerly of Mussens Limited, is now acting as Eastern Manager for the Parsons Company with office in New York.

We had a call from Fred. Peckham of Gorman & Peckham, who are working at Hebertville for the Quebec Streams Commission. He tells us that Tom Gorman had an accident and fractured his collar bone.

We had an interview last week with Miles Lonergan of Quebec. He tells us that he has sufficient work to keep him busy all summer.

The Burpee Construction Company of Devon, New Brunswick, are building 4½ miles of branch line for the Canadian National Railways at Lockport, Nova Scotia.

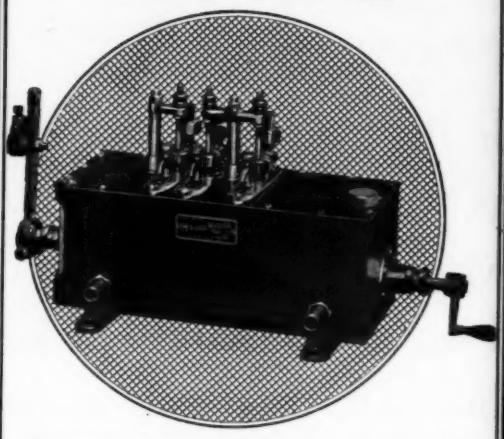
Toronto and Vicinity

BY C. F. ENGLAND

The Nelson River Construction Company are getting well under way on their Humber Valley sewer job for York Township, Toronto, Ontario.

Jas. A. Wickett, Limited, of Toronto, have recently secured contract for the St. Catharines filtration plant at something over $200,000. This work embodies considerable excavating, which we understand will be done by Lioni & Company of Toronto, also a large amount of concrete which will be taken care of by the contractors.

If a Shovel is Worth Buying It's Worth Lubricating



YOU buy the best shovel, why not treat it right after you've gotten it? Oil at the right time and in the right quantities is one of the most important items in keeping machinery on the job and out of the scrap pile.

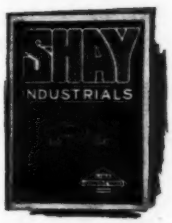
McCord Lubricators feed live, fresh oil to the right places and in the right quantities only when the engine is running. They stop with the engine and always start with it.

Insure against breakdowns by putting a McCord Force Feed Lubricator on your shovel now. The time lost as the result of one breakdown will pay for the lubricator.

McCord Radiator & Mfg. Co.
Lubricator Division
Detroit, Mich.

McCord
force feed
Lubricators
Standard of the Oil fields

"The Only Engine for Pit Operation"



May we send you our catalog?

Asked what he thought of the Shay, the President of a large company wrote:

"We have in use a Mogul locomotive, six-wheel switch engine and Shay Geared Locomotive. We find the Shay Geared Locomotive the most popular with the plant superintendent and employees. ***I think it is the only engine for pit operation.***"

When it comes to taking a heavy load out of the pit, the Shay Geared Locomotive will outpull a bigger rod engine. And the Shay is a better engine on rough track and sharp curves. With its small, evenly spaced geared wheels and its flexible driving shaft, the Shay works successfully on track that a rod engine would destroy.

If you are not familiar with what Shays are doing under conditions like yours, write for information.

LIMA LOCOMOTIVE WORKS

Incorporated

Lima, Ohio — 17 East 42nd St., New York

LIMA

Shay Geared **LOCOMOTIVES**

The Lumsden Engineering & Transport Company are busy getting their camps up for their work on Section Seven of the Welland Ship Canal, and hope to be able to start actual work in the very near future.

It is reported that the Toronto and York Roads Commission will spend $500,000 this year on road construction and repairs.

Vancouver and Vicinity

BY J. C. MOON

A by-law covering the development of the Vancouver water supply was passed by a large majority recently, and will mean an expenditure of about $1,250,000. Included in this will be the laying of about fifteen miles of 36-inch steel pipe and construction of a tunnel under the Second Narrows to carry the mains across the harbor. Work will commence at once on this project.

A contract has been let by the British Columbia Electric Railway Company to the Pacific Engineers, Ltd., of Vancouver, for the construction of a massive hydraulic-fill dam in connection with the Stave and Alouette Lakes hydro-electric development scheme. The cost of the dam will be about $300,000.

TRADE NOTES

Otto E. Stoll, general manager of the General Motors Truck Company, announces the appointment of A. J. Banta as assistant to the general manager. Mr. Banta will have complete charge of engineering, manufacturing and purchasing. Mr. Banta has had more than 20 years' experience in the automotive industry, both in Detroit and in the East.

Two new branches have just been opened by the General Motors Truck Company. One is located in Jacksonville, Florida, and the other in Dayton, Ohio.

The *Barber-Greene Company* have placed assistants with their district managers at Pittsburgh, Cleveland, and Detroit. H. H. Driver will assist J. A. Gurney in Pittsburgh; Frank S. Howard, Jr. will assist E. D. Cassel in Cleveland, and P. S. Frederick will assist C. B. Gould in Detroit.

The *Koppel Industrial Car and Equipment Co.* of Koppel, Pennsylvania, have opened a new sales office and warehouse in San Francisco, under the management of Harry C. Kraft.

The engineering in this office will be handled by A. E. Prager, who has had many years of experience in designing cars for contracting and engineering purposes.

This new sales agency will be known as the "Koppel Sales Company, Inc.," and will be located in the Rialto Building, San Francisco, California.

A large stock of material will be on hand to give immediate service to the Western states.

The *Moon Manufacturing Company* has recently placed upon the market a new steam turbo generator set to be known as their Type No. 6. This turbo generator has a capacity of 4 kilowatts and is supplied in varying voltages. A copy of the bulletin descriptive of this apparatus may be obtained by application to the *Moon Manufacturing Company, 108 North Jefferson Street, Chicago, Illinois.*

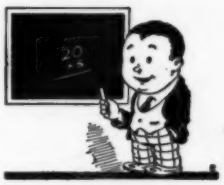


FIGURE IT OUT YOURSELF

MATERIAL Saved + TIME Saved = MONEY Saved = MORE PROFITS

Our packing is put up in packages containing just enough of the right size for each stuffing box on your Bucyrus.

No waste material — no time required for measuring, cutting and fitting.

We have—

FLEXIBLE METALLIC,
Standard on our new machines.

BUCYRUS GRADE A,
A superior asbestos packing used by many who prefer soft packings.

MOULDED METALLIC,
More expensive, but long-lasting and easy on machinery.

Just give us your machine number and say for which engine it is required, and we will supply the packing you prefer, put up in handy packages, ready to install.

BUCYRUS COMPANY
SPECIALTY DEPARTMENT
SOUTH MILWAUKEE, WIS., U. S. A.

Du Pont chemical engineers insure uniformity of quality by chemical control through every step of manufacture from raw material to finished product.

How chemical control insures du Pont quality

DU PONT explosives do just what you expect of them — just what you want them to do — because they are absolutely uniform in quality and adapted to your requirements.

To insure du Pont explosives being of the highest quality, the du Pont Chemical Engineers watch every manufacturing step for *you*. By chemical control of materials and processes, they assure you of unvarying du Pont quality. It is the maintenance of uniform quality that has given the du Pont Company the reputation it enjoys today in the explosives field.

Certainty in blasting results is obtained by the selection of the *right* type of explosive and its proper use.

Blast with du Pont Explosives

There is a du Pont explosive to meet every blasting need — to do *your* particular work *best* at *least* expense. For contracting we especially recommend:

Red Cross Extra Dynamite: 20% to 60% strength; low-freezing; fairly water-resisting; heaving and lifting action.

Du Pont Gelatin Dynamite: 25% to 90% strength; water-resisting; low-freezing; dense; plastic; less obnoxious fumes.

Du Pont R. R. P. (Judson type): 5% strength and low-freezing.

Du Pont Blasting Powder is the most widely used low-explosive. It is regarded as standard everywhere. Every keg bears the orange band.

Du Pont Blasting Accessories give you maximum efficiency from your explosives. Make every shot *sure* — protect your blasting investment by using only du Pont accessories.

For further information about du Pont explosives and blasting accessories, please refer to *Road and Street Catalog*—or write to our nearest office.

E. I. DU PONT DE NEMOURS & CO., INC.
Explosives Department Wilmington, Delaware

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Birmingham . . Ala.
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Du Pont Products Exhibit Atlantic City, N. J.

POWDER MAKERS SINCE 1802

For convenience in making inquiry use postal inserted in this number.

An interesting test of du Pont traffic white paint was recently made at Knoxville, Tennessee. Four-inch lines were laid down at an average rate of 200 lineal feet per minute, paint consumption at the rate of 7.6 gallons per mile.

The material was applied as a first coat to a new concrete surface. At a temperature of 49 degrees F., the paint was track-proof in twenty-seven minutes.

In putting down the material it was found that it required no change of pressure or feed in the machine.

REVIEW OF BOOKS and CATALOGS

We shall be glad to review, in this column, such books and catalogs as are sent to us.

HOISTING CHAIN — 8 pages, illustrated. Every operator of railroad-type shovels will be interested in the information on the material and making of a hoisting chain, its care, annealing, lubrication, etc., contained in this bulletin. This bulletin also contains tables giving the dimension of the links for chains of various sizes, the diameter of the material from which the links are made, the safe working load, breaking strain and weight per 100 feet. For copy write *Bucyrus Company, Specialty Department, South Milwaukee, Wisconsin.*

CLEVELAND PAVING BREAKERS — 6 x 9 inches, 10 pages and cover. Describes and illustrates a rugged rock drilling machine of standardized elements which have given years of satisfactory service in rock drilling. A suitable machine for each special purpose, from the light-weight tool for trimming to the hard-hitting powerful hammer-blow tool for brick, asphalt and rock. For copy address *The Cleveland Rock Drill Company, 3734 East 78th Street, Cleveland, Ohio,* and ask for Bulletin No. 57.

LAKEWOOD FINISHERS — 8½ x 11 inches, 14 pages with cover, illustrated. Describes Lakewood tampers and screeds which give to concrete roads that quality, form and smoothness so difficult to produce by hand. Address *The Lakewood Engineering Company, Cleveland, Ohio,* and ask for BULLETIN No. 42-A.

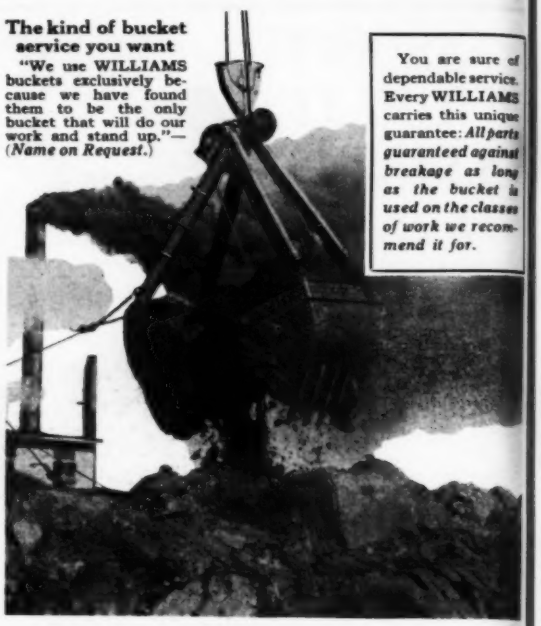
HISTORY OF THE PORTLAND CEMENT INDUSTRY IN THE UNITED STATES — By Robert W. Lesley, 6 x 9 inches, 330 pages in green buckram binding, illustrated and indexed. Covers discovery, pioneering, science, development, modern methods and cement plant machinery, foreign and domestic cements — in fact, a complete treatise of an industry of vital importance to the nation. Published by *International Trade Press, Inc., Chicago, New York and London.*

BARCO LUBRICATED PLUG VALVES — 8½ x 11, four pages. This bulletin describes a plug valve in which provision is made for lubricating the moving surfaces by means of grease. Copy of this bulletin, No. 301, may be had by application to the *Barco Manufacturing Company, 1801 Winnemac Avenue, Chicago, Illinois.*

CONSTRUCTION AND CONSTRUCTION MATERIAL — A reprint of 43 pages from "Commerce Year Book." Contains 24-page article on "construction" and 19 pages on "construction materials," with tables of basic statistics, and diagrams showing principal tendencies. Address *Department of Commerce, Washington, D. C.*

The kind of bucket service you want

"We use WILLIAMS buckets exclusively because we have found them to be the only bucket that will do our work and stand up."—*(Name on Request.)*



You are sure of dependable service. Every WILLIAMS carries this unique guarantee: *All parts guaranteed against breakage as long as the bucket is used on the classes of work we recommend it for.*

If ever in doubt

Let the bucket do the talking

When you're told that another bucket will give you as much output as a WILLIAMS — *decide by actual performance.*

We are always glad to put you in touch with WILLIAMS users near you who have made careful tests of different buckets, and know from experience which is the best digger.

Tell us what kind of excavating or rehandling you have to do, and we will quote you on a WILLIAMS which is guaranteed to move more material. Not just for one day but every day, month after month.

G. H. WILLIAMS COMPANY, 603 Haybarger Lane, Erie, Pa.
EASTERN OFFICE: 30 Church St., New York City

WILLIAMS
QUICK-ACTING CLAMSHELLS
All Parts Guaranteed Against Breakage

Two New TRUCKS that set a New Standard

GMC again has provided a new measure of motor truck quality with the new 1 ton and 1½ ton models.

Not only do these trucks embody the well-known GMC principles of design, but they provide further refinements in construction and arrangement which are revealed in more power, more speed, more safety, more comfort for the driver, and easier and quicker adjustment or replacement of wearing parts.

New and more powerful engines, mechanical four-wheel brakes, new type rear axles with banjo housing, new transmissions, new design radiators and hoods, new and easier steering gears, magneto ignition, cord tires, electric starting and lighting.

These are among the many improvements found in the new GMC models — improvements which establish their quality as second to none among motor trucks of their capacities.

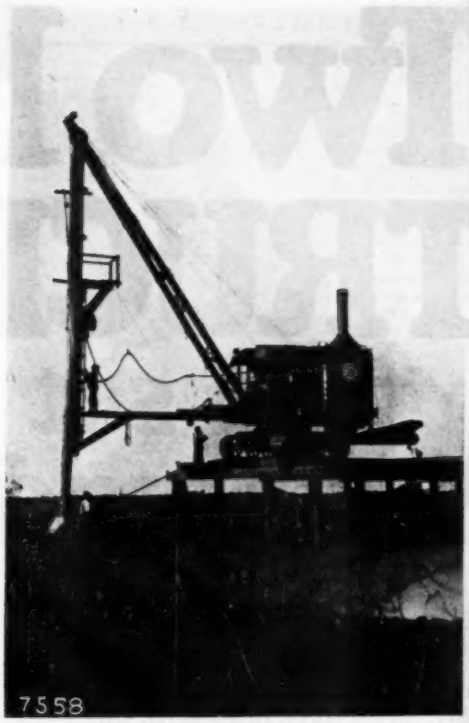
GENERAL MOTORS TRUCK COMPANY
Division of General Motors Corporation
PONTIAC, MICHIGAN

Trucks and Tractor Trucks from 1 to 15 Tons Capacity

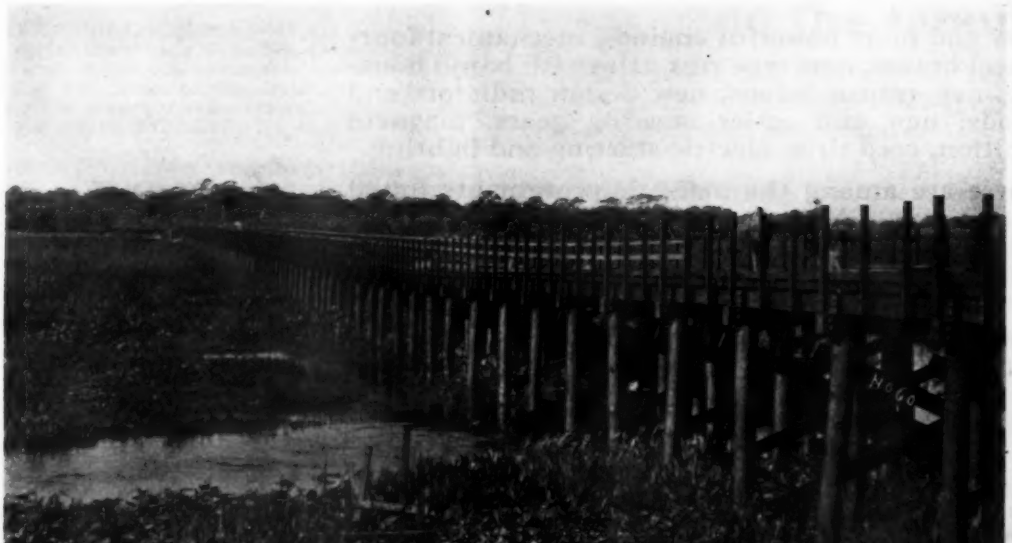
General Motors Trucks

For convenience in making inquiry use postal inserted in this number.

Small Revolving Shovel, with Dragline Boom, Driving 40-foot, Creosoted Piles on East Approach of Harding Memorial Bridge



Driving Piles for Harding Memorial Bridge. Note piling swung from back of machine to act as extra counterbalance of leads, etc.



Looking west from draw span of Harding Memorial Bridge. Note the almost perfect alignment of piling. Piles in the immediate foreground are 45 feet long.

Views of the Bridge Across the Kissimee River in the Everglades, Florida